

CHAPTER 2  
SPECIFICATIONS

2.1 DIVERTER-TYPE MECHANICAL SAMPLERS

a. General Requirements.

- (1) The design, construction, and location of samplers and related equipment must suit the intended official use of the sampling system.
- (2) FGIS must approve the model and type of primary (Figure 1) and secondary sampler used in the system.
- (3) The FGIS field office manager must authorize the system for official use based on the examinations and tests specified in Chapters 4 and 5.
- (4) Official personnel shall maintain accurate and up-to-date documentation and drawings (in their official files) on system design, installation, and approved modifications.
- (5) The sampling system must be accessible for full and safe inspection.

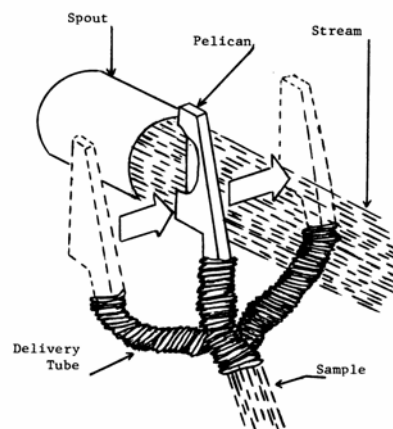


Figure 1. Diverter-Type Sampler

b. Equipment Requirements.

- (1) Overall dimensions of the primary sampler must be adequate for the volume and velocity of the commodities to be sampled. Primary samplers must allow:
  - (a) All of the commodity presented for sampling to be accepted by the pelican as the pelican passes through the stream, and
  - (b) Delivery of all of the sampled commodity to the secondary sampler.
- (2) The design, construction, materials, and quality of the equipment must be such that it can withstand normal use without loss of accuracy or reliability. Under normal operating conditions, operating parts will remain fully operable and adjustments will remain reasonably constant.
- (3) The primary and secondary mechanical samplers shall be permanently marked to show their manufacturer, model designation, and serial number. Facility management must arrange for the manufacturer to supply new I.D. plates for old, unmarked samplers.
- (4) The pelican (See Figure 1.) must traverse at an even speed, as close as possible to ½ meter (20 inches) per second.
- (5) Power sources, valves, and switches must conform with the following requirements:
  - (a) Air supply for air-operated primary samplers must be uniform and maintain specified operating pressure. If scale operations or other air uses cause a loss of effective working pressure, a separate air supply system must be installed.
  - (b) Maintain constant line voltage to ensure correct operation of electrically-operated primary and secondary samplers.
  - (c) Valves, switches, solenoids, cylinders, motors, or other activating or operating mechanisms must be high quality, positive action devices that meet all OSHA and FGIS safety requirements and appropriate local codes.

- (6) Controls.
  - (a) Controls must be under the direct supervision of the assigned official inspection personnel or warehouseman sampler. Also, any auxiliary controls must be under their exclusive control. A lockout switch is not considered an auxiliary control. Refer to Page 2-7 for information on lockout switches.
  - (b) Controls for mechanical samplers and related sample handling systems, including but not limited to push buttons and switches, shall be conspicuously identified as to the equipment or activity controlled by the push button or switch.
- (7) A sealable or lockable inspection plate must be installed on each primary and secondary sampler to allow quick and easy examination of all moving parts. Most plates should be hinged and have one or two wing nuts and a sealable hasp. The inspector should not have to use tools to remove the plate.
- (8) Plates should be positioned to allow viewing the entire length, and directly into the pelican opening. They should allow complete viewing of the dust seals.
- (9) Older, previously approved sampler installations must have inspection plates upgraded to meet the above requirements when repairs or major maintenance are done.
- (10) Access to the inspection plates must be free of hazards.
- (11) Inspection plates are not required on rotary-type secondary samplers constructed of cast metal. This does not eliminate the need to open and examine the secondaries during a condition examination.
- (12) Secondary samplers used for reducing the size of samples obtained by the primary sampler must be appropriate for the type of facility in which they are installed:
  - (a) Facilities with a maximum flow rate of less than 10,000 bushels per hour (passing the sampling site either through a spout or carried on a belt) may use a powered secondary sampler or a

cargo-type divider. For cargo-types, sample feed must be directed to the center of the divider. If it plugs, clogs, or creates other problems, it must be replaced with a powered secondary sampler.

- (b) Facilities with a maximum flow rate of 10,000 bushels per hour or more (passing the sampling site either through a spout or carried on a belt) must use a powered secondary sampler.
- (13) The entire diverter pelican opening must be at least  $\frac{3}{4}$  inch (1.9 cm) but less than  $\frac{7}{8}$  inch (2.2 cm) wide. If required for structural strength, the manufacturer (or owner, if according to the manufacturer's drawings) may install small braces in the pelican opening.
- (14) Secondary samplers must be large enough to reduce the quantity of sample delivered by the primary sampler without backing up. All secondary samplers, including those that use adjustable slot openings (ratio adjustment plate), must be set so the slots are not narrower than  $\frac{3}{4}$  inch (1.9 cm). Any slot adjustment plates must be secured or sealed in position for testing and use.
- (15) Sample return mechanisms should be designed to return excess sample to the lot from which taken.
- (16) Sample delivery tubing, flexible or rigid, must be physically secured (clamps, sealants, security seals, etc.) at all junctions that would allow the representativeness of the sample to be easily altered by adding or removing material.
- (17) Air intake vents on pneumatic delivery systems must have a suitable screen or cover sealed or fixed in place to prevent the introduction of material into the official sample.
- (18) All sampler inspection plates, operating controls, timers, air intake vents, and sample collection boxes must be secured, locked, or sealed closed when they are not located in the official inspection laboratory and/or are not continuously attended by official inspection personnel or the warehouseman sampler.
- (19) If the primary sampler (or other) seals need to be broken by the facility for maintenance or unofficial use, notice (before) or explanation (after) must be given to official inspection personnel. The official personnel must physically examine the affected area and if satisfied that the integrity of the system is not compromised, all broken seals must be replaced. If notice or suitable explanation is not given and seals are found broken, the

system must be reexamined (condition examination). The testing office may also require testing using five lots of grain.

- (20) When application of security seals to a primary or secondary sampler will not provide an increased level of security, they are not required. For example, where access through the belt opening in the sampler hood cannot be eliminated (belt-end diverter sampler).
- (21) The entire sampling system must be self-cleaning to prevent contamination of a commodity from one lot to another.

c. Installation and Site Requirements.

- (1) Installation shall be at a site approved by FGIS, according to the manufacturer's instructions and so that neither the operation nor the performance of the equipment or system will be adversely affected by the foundation, supports, or any other characteristic of the installation.
- (2) Primary samplers must be installed in such a location as to ensure the representativeness of the samples obtained.
  - (a) "Out" movement samplers. Primary samplers must be installed after the final elevation of the commodity, as close as physically practicable to the end of the loading spout. Final elevation is defined as the last elevation by bucket elevator, pneumatic sucker, drag, paddle, screw conveyor, or other devices. Inclined belts are not considered an elevation, since they will not cause grain breakage.
    - 1 Primary samplers must not be installed in vertical spouts with long drops or sharp-angled turns.
    - 2 The sampler must be located so that all of the grain sampled will be delivered to the carrier. This can be a problem when grain has been sampled, but then a small part of it will not fit in the carrier and is returned to the house or put in a different carrier. This renders the sample non-representative.

- a For example, the sampler must not be located above an upper scale garner when loading rail cars. If so, it could result in some grain sampled (the grain in the garner) actually going to the next car in line.
  - b At barge loading sites the amount of grain retained in a garner or on a section of belt that is sampled but does not get loaded aboard the barge will need to be calculated. If significant, special procedures will need to be developed to clear the system or it cannot be approved.
  - c For ship sublots, the garner amount effect on the sample is usually insignificant.
- (b) "In" movement samplers. Primary samplers should be installed before or immediately after the initial elevation of the commodity. Initial elevation is defined as the first elevation by bucket elevator, pneumatic sucker, drag, paddle, screw conveyor, or other devices. Elevation by marine leg at barge unloading sites is also considered an initial elevation.
- (3) If screw or drag conveyors, swivel loaders, belt-type throwers, or air-blast throwers are used to propel the commodity after sampling for outbound inspection, or before sampling for inbound inspection, the facility operator shall furnish evidence based on comparison testing that their use does not alter the condition of the commodity.
- (4) The secondary sampler must be mounted in a vertical, reasonably-level position, and be located as close to the primary sampler as possible. In facilities where this is not practical, or in facilities where manlifts would be the only means of transporting samples and personnel to and from the sampler, the secondary sampler may be installed at ground level. This does not eliminate the need for a safe means of access to the primary sampler for examination purposes.
- (5) The primary and secondary sites must be free of hazards that jeopardize the safety of official inspection personnel.
- (6) Adequate floor space, as defined by official personnel, must be provided at the proposed sites.

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- (7) Protection and guards must be provided for floor and bin openings, low beams, spouts, moving belts, and chains.
- (8) The sites must be kept clean and free of excessive dust, spilled commodities and refuse. Regular cleaning must be a part of the facility's maintenance program.
- (9) Lighting at the primary sampler installation site must be a minimum intensity of 30-foot candles to allow thorough examinations of the primary sampler. Where artificial lighting is used, it should be permanently installed rather than portable.
- (10) Safe access to the primary sampler site and the sampler shall be provided by passenger elevators, stairs, or approved ladders. Stairs and ladders must meet safety standards (29 CFR 1910.24, .27, etc.) Consult with the field office collateral duty safety officer (CDSO) for assistance in applying these standards.
- (11) Approved lockout switches shall be installed, and approved lockout procedures shall be used to ensure the safety of personnel examining the primary and secondary samplers. Further information can be found in 29 CFR 1910.147, "The control of hazardous energy (lockout/tagout)."
- (12) The lockout switch must be under the exclusive control of the person making an examination through locking devices such as a padlock. Zero energy state includes all mechanical, electrical, hydraulic, and pneumatic equipment that may cause the D/T to operate. Lockout procedures are specified in Chapter 4.

d. Timer Requirements.

- (1) Timers may be analog or digital. (Automated systems having timers that reside in programmable controller logic require special evaluation and approval from FGIS headquarters.)
- (2) For official use, analog timers do not need and should not have a maximum dial setting greater than 5 minutes, since all required settings

are 3 minutes or less. Timers with large maximum settings may have less accuracy in lower ranges.

- (3) Precision timing is not required. However, a properly functioning timer must be accurate to approximately  $\pm 1$  division; e.g., an Eagle timer of 60 seconds maximum dial setting, marked in 1-second divisions must be accurate  $\pm 1$  second at any setting. If not, it must be repaired or replaced.
- (4) When the commodity flow rate is 4,000 bushels or less per hour, set the timer at not more than 3 minutes.
- (5) When the flow rate is more than 4,000 bushels per hour, set the timer so that the pelican traverses the sampling area each 200 bushels, unless the flow rate lends itself to a larger sampling interval as decided by the inspector in charge, using Table I.
- (6) Actual flow rate past the sampler is not always equal to the facility's claimed load out rate. Use the flow rate of the facility's predominant grain to figure out the timer setting.

For example: An elevator has one D/T sampler located under Scale No. 1 used to load out hopper cars of corn. The scale holds about 170 bushels, and the discharge takes 15 seconds. This equals 40,000 bushels per hour (bu/hr) going past the sampler. The scale will take another 15 seconds to fill each scale draft, lessening the facility's load out rate to 20,000 bu/hr or less. If the facility is inefficient at moving cars, etc., it may not even load as fast as 20,000 bu/hr, but the timer setting would still be based on 40,000 bu/hr. Referring to Table I, the timer setting could be either 18, 31 or 45 seconds.

- (7) If the recommended timer settings yield too much or too little sample in the collection box, it is an indication that the secondary sampler does not offer the appropriate reduction. It may be necessary to repair, replace, or adjust the secondary.
- (8) If needed, the timer can be set to take cuts more frequently than shown in the table, but this is not recommended. Turning up the timer may cause the secondary to back up. Verify by examination that the secondary clears before the next pelican cut delivers more grain. Document the examination and the new timer settings in the file.
- (9) Use one timer setting for both testing and official sampling. The system should be used "as tested" unless item (8) applies.



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- (10) Do not change timer settings for different grains or carriers except as approved and noted on the Form FGIS-998.
- (11) Do not change timer settings during official sampling. For example, if 5,000 grams represent the sample from one bin, another similar bin should be represented by 5,000 grams, too. When timer settings are changed, this proportional relationship is lost.
- (12) Scale dump counters are not allowed on or in lieu of the timer circuit, since they do not allow cuts to be taken randomly throughout the lot.
- (13) Energy to the timer circuit should not be interrupted by counters, gate interlocks, or programmable controllers, since the timer will reset to zero and randomness of sampler cuts will be lost. (Safety lockout switches must disconnect timer circuits and also motor circuits.) Headquarters may grant an exception when circuit interrupts for the sampler motor are needed, if properly justified.

Table I, Timer Settings

Flow Rate Past Sampler (bu/hr)	Sampling Rate (Seconds) One cut each:		
	200 bu	350 bu	500 bu
10,000	72		
15,000	48		
20,000	36		
25,000	28	50	
30,000	24	42	60
35,000	20	36	51
40,000	18	31	45
45,000	16	28	40
50,000	14	25	36
55,000	13	22	32
60,000	12	21	30
65,000		19	27
70,000		18	25
75,000		16	24
100,000			18
125,000			14
150,000			12

$3,600 \text{ (s/hr)} * 200 \text{ (bu) sampling rate} / \text{max flow (bu/hr)} = \text{timer setting (s)}$

- e. **Mixing and Blending Requirements.**
- (1) Mixing and blending of the commodity to be sampled must be completed before the commodity reaches the primary sampler. If multiple samplers (more than one conveyor belt or spout) are used, the feed to each must be uniform in kind and quality.
  - (2) If an offgrade commodity is placed in the shipping bin, a procedure must be developed to ensure that the entire quantity of offgrade commodity is returned to the facility. Multibottomed or windowed shipping bins may cause segregation of the commodity. Therefore, when an offgrade commodity has been loaded into one section, all of the commodity in the sections joined by windows must be returned to the facility.
- f. **Lot Integrity Requirements.** There must be no provision for adding material (except insecticides) or removing material from the commodity after it has passed the primary sampler. If there are feeders or diversion points between the sampler and the carrier, the points must be closed securely by using locks, seals, or electronic security measures that are under the complete control of the sampling attendant. When security measures include visual monitoring, the monitoring must be continuous-not intermittent.

## 2.2 POINT-TYPE MECHANICAL SAMPLING SYSTEMS

Point-type mechanical sampling systems are approved only for Group 3 powdered commodities. These commodities are more homogeneous than the other groups and have less particle segregation. They do not use a pelican to completely cross cut the stream of commodity through a spout. Instead, they often use a tube with a hole or slot and an auger delivery system. Specifications for point-type samplers are identical to those for diverter-type samplers except for pelican design and timer settings, which are not applicable.

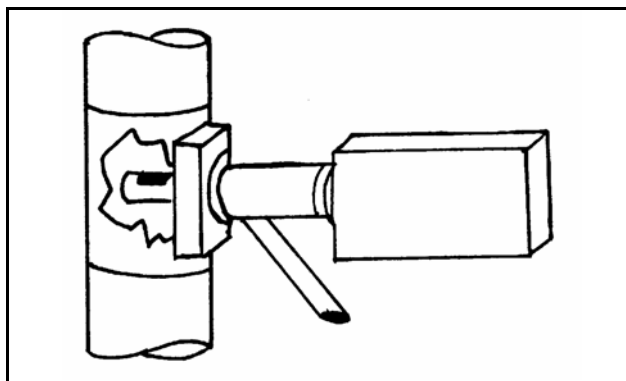


Figure 2. Point-Type Sampler

## 2.3 PROBE-TYPE MECHANICAL SAMPLERS (TRUCK PROBES)

### a. General Requirements.

- (1) The model and type of probe-type mechanical sampler must be approved by FGIS. Figure 3 shows the current designs, of which two are approved. In-load suction probes may not be tested or approved. They draw air through the load of grain and vacuum excessive amounts of fine foreign material into the sample.
- (2) The system must be authorized for official use based on the tests and examinations specified in Chapter 5.

### b. Installation and Site Requirements.

- (1) The facility must be free of hazards that jeopardize the safety of official inspection personnel.
- (2) The site must be kept clean and free of excessive dust, spilled commodities, and refuse.
- (3) The reach of the probe must enable the operator to follow the standard probing patterns and procedures. Normally a truck would not need to be moved more than once to reach all areas of the load.

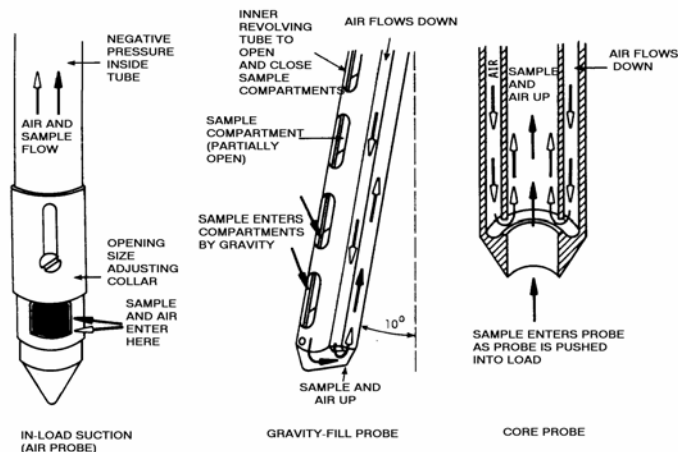


Figure 3. Probe-Type Samplers

- (4) The length of the probe should enable the operator to reach the bottom of truck loads that are sampled.
  - (5) Lockout switches and/or devices must be installed.
- c. Installation Procedures. Probe-type mechanical sampling systems must be installed according to the manufacturer's specifications. After testing, secure all adjustable components that affect air flow by use of covers, seals, locks, or electronic security measures.

## 2.4 WOODSIDE SAMPLERS

- a. There are few woodside sampler installations remaining approved for official grain inspection. Woodside samplers have not been manufactured for many years, and parts are difficult to obtain or fabricate.
- b. Diverter-type mechanical samplers generally require less official supervision and provide a more representative sample at the higher grain flow rates that are used today. FGIS believes that the elimination of woodside samplers from the official system will provide for greater uniformity and reduce unnecessary administrative costs.
- c. Existing approved woodside samplers may remain authorized, if they are presently used for official sampling. Official personnel were notified 2-11-94 that if the authorized woodside sampler was not used officially, or used only for in-house quality control, the facility should be notified that the authorization will be revoked effective 1 year from that date.
- d. No new applications for authorization of woodside samplers will be accepted.

Reserved